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Catalytic Aquathermolysis of Heavy Oil with Iron Tris(acetylacetonate): Changes of Heavy Oil Composition and in Situ Formation of Magnetic Nanoparticles

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Abstract

© 2015 American Chemical Society. We investigated the influence of catalytic aquathermolysis on the composition changes of Ashal'cha heavy oil. The synergetic effect of organic solvent and an oil-soluble catalyst leads to deep conversion of resins into light components. Composition changes of resins and asphaltenes before and after aquathermolysis were investigated by proton nuclear magnetic resonance (^{1}H NMR), Fourier transform infrared spectroscopy (FTIR), matrix-assisted laser desorption/ionization mass spectrometry (MALDI MS), and elemental analysis. It was shown that iron(III) tris(acetylacetonate) forms magnetic nanoparticles (MNPs) during aquathermolysis of heavy oil without any addition of surfactants. Composition of MNPs was determined as a mixture of hematite, magnetite, and maghemite. It turns out that obtained MNPs possess superparamagnetic properties of single-domain nanoparticles.

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